IEEE Recommended Practice for the Characterization and Evaluation of Emerging Energy Storage Technologies in Stationary Applications

IEEE Power & Energy Society

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Stationary Batteries Committee

1679™

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3 Park Avenue
New York, NY 10016-5997, USA

29 October 2010

IEEE Std 1679™-2010

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IEEE Power & Energy Society

Approved 17 June 2010

IEEE-SA Standards Board

Abstract: Recommended information for an objective evaluation of an emerging energy storage device or system by a potential user for any stationary application is covered in this document. Energy storage technologies are those that provide a means for the reversible storage of electrical energy, i.e., the device receives electrical energy and is able to discharge electrical energy at a later time. The storage medium may be electrochemical (e.g., batteries), kinetic (e.g., flywheels), electrostatic (e.g., electric double-layer capacitors), thermal, or some other medium. Devices recharged by non-electrical means, such as fuel cells, are beyond the scope of this document. The document provides a common basis for the expression of performance characteristics and the treatment of life-testing data. A standard approach for analysis of failure modes is also provided, including assessment of safety attributes. The intent of this document is to ensure that characterization information, including test conditions and limits of applicability, is sufficiently complete to allow valid comparisons to be made.
Keywords: battery, cycling service, electric double-layer capacitor, energy storage, flywheel, standby service, stationary application

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PDF: ISBN 978-0-7381-6363-5 STD96088
Print: ISBN 978-0-7381-6364-2 STDPD96088

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Introduction

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Recent years have seen a significant increase in the number of energy storage devices being proposed for use in traditional battery applications. In addition, the characteristics of an emerging technology may be an enabling factor for new energy storage applications. A problem may arise, however, in the provision and analysis of information regarding the new technology. For existing applications, the technology developer may not be aware of the conventions already in use for submittal of technical data. Furthermore, the prospective user may not request or receive sufficient information to enable a full comparison to be made between technologies.

This recommended practice describes a format for the characterization of emerging energy storage technologies in terms of performance, service life, and safety attributes. This format provides a framework for developers to describe their products. The resulting information assists users in evaluating the possible application of emerging energy storage technologies.

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1. Overview

1.1 Scope

This document covers recommended information for an objective evaluation of an emerging energy storage technology by a potential user for any stationary application. Energy storage technologies are those that provide a means for the reversible storage of electrical energy, i.e., the device receives electrical energy and is able to discharge electrical energy at a later time. The storage medium may be electrochemical (e.g., batteries), kinetic (e.g., flywheels), electrostatic (e.g., electric double-layer capacitors [EDLCs]), thermal, or some other medium. Devices recharged by non-electrical means, such as fuel cells, are beyond the scope of this document.

For the purposes of this document, "emerging" technologies are defined as those technologies recently, or soon to be, made available for sale under customary commercial terms (e.g., defined scope-of-supply, warranted performance). Stationary applications include both standby and cycling operation.

The document provides a common basis for the expression of performance characteristics and the treatment of life-testing data. A standard approach for analysis of failure modes is also provided, including assessment of safety attributes. The intent of this document is to ensure that characterization information,